

## CLAIMS:

1. A process for producing electricity in a fuel cell which comprises reacting a higher carbon ( $C_{2+}$ ) hydrocarbon fuel with steam in a steam pre-reformer at a temperature in the pre-reformer of no greater than  $500^{\circ}\text{C}$  to produce a fuel stream including hydrogen and no less than about 20% by volume methane measured on a wet basis, and supplying the fuel stream and an oxidant to a high temperature fuel cell in which the methane is reformed and electricity is produced by reacting the fuel stream at an anode of the fuel cell and reacting the oxidant at a cathode of the fuel cell.
2. A process according to claim 1 in which the fuel stream includes no less than about 25% by volume methane measured on a wet basis.
3. A process according to claim 2 in which the fuel stream includes no less than about 40% by volume methane, even more preferably no less than about 50% by volume methane, and most preferably no less than about 60% by volume methane, measured on a wet basis.
4. A process according to any one of claims 1 to 3 in which the temperature in the steam pre-reformer is no more than about  $450^{\circ}\text{C}$ , more preferably in a range of about  $250^{\circ}\text{C}$  to  $450^{\circ}\text{C}$  and most preferably in a range of about  $300^{\circ}\text{C}$  to  $400^{\circ}\text{C}$ .
5. A process according to any one of claims 1 to 4 in which the reaction of the fuel with steam in the methane generator is performed adiabatically.
6. A process according to any one of claims 1 to 5 in which the steam to carbon ratio in the methane generator is no more than 1.5, more preferably no more than 1.25 and most preferably no more than 1.0.
7. A process according to claim 6 in which additional steam is introduced to the fuel stream downstream of the steam pre-reformer.

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8. A process according to claim 7 in which the additional steam is recycled from an anode exhaust stream.

9. A process according to any one of claims 1 to 8 in which the fuel is a  $C_{3+}$  hydrocarbon fuel.

10. A process according to claim 9 in which the fuel is selected from the group consisting of LPG, gasoline (petrol) and diesel, kerosene, fuel oil and jet fuel.

11. A process according to any one of claims 1 to 10 in which the fuel is selected from the group consisting of ethane, propane, butane, LPG, gasoline (petrol), diesel, kerosene, fuel oil, jet oil, naphtha and mixtures of two or more of these.

12. A process according to any one of claims 1 to 11 in which the reaction at the anode of the fuel cell is performed at a temperature of at least  $700^{\circ}\text{C}$ .

13. A process according to any one of claims 1 to 12 in which waste heat from the fuel cell is recycled to the steam pre-reformer.

14. A process according to any one of claims 1 to 12 in which the reaction in the steam pre-reformer results in the conversion of at least 97.5% of the higher carbon ( $C_{2+}$ ) hydrocarbon fuel.

15. A process according to claim 14 which results in at least substantially complete conversion of the higher carbon ( $C_{2+}$ ) hydrocarbon fuel.

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